

## SEXUAL BEHAVIOUR

## Male genital hygiene beliefs and practices in Nairobi, Kenya

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**Objectives:** Attitudes and practices concerning genital hygiene may influence topical microbicide use by men. This study examines knowledge and behaviours related to hygiene, genital hygiene, circumcision and hygiene, and to genital hygiene before and after sex among men in Nairobi, Kenya.

**Methods:** We conducted 463 interviews of men recruited by respondent driven sampling techniques and 10 focus group discussions with a subsample of 100 volunteers from this group. Men were asked individual quantitative survey and qualitative group discussion questions about general hygiene behaviours, genital hygiene, and the temporal relation of genital hygiene behaviours to sexual encounters.

**Results:** Bathing once daily was associated with education, income, and inside tap water. Genital washing aside from regular bathing and washing before sex ever were negatively associated with bathroom crowding. Genital hygiene before the most recent sexual encounter was uncommon and negatively associated with HIV risk perception, bathroom crowding, and ethnicity. Men believed genital hygiene before sex would arouse suspicions of infidelity or cool sexual ardour. Genital hygiene after sex was associated with education, religion, and having inside tap water. Genital hygiene after the most recent sexual encounter was associated with age, income, and with men having at least one child.

**Conclusions:** Genital hygiene behaviours were associated with resource access factors and group discussions suggest that they are modulated by interactions in sexual partnerships. Topical microbicides may improve hygiene before and after sex.

Genital hygiene practices may be important for diseases like sexually transmitted infections (STI), which are common among adults in the developing world. In women, vaginal hygiene practices like douching have been linked to an increased frequency of bacterial vaginosis (BV) infections in the United States.<sup>1</sup> In Bali, genital cleansing by commercial sex workers after sexual intercourse was associated with fewer infection symptoms but not with the point prevalence of sexually transmitted infections (STI).<sup>2</sup> Poor male genital hygiene has been associated (in the era preceding human papillomavirus testing) with several disease processes including penile cancer in men<sup>3–4</sup> and cervical cancer in women.<sup>5–7</sup> Furthermore, post exposure soap and water prophylaxis was associated with a decreased incidence of genital ulcer disease in American forces in the first and second world wars<sup>8–10</sup> and prevented development of lesions after inoculation of abraded skin with *Haemophilus ducreyi*.<sup>10</sup>

Men can also carry STI pathogens on the genital epithelium and can then transmit them to sexual partners. BV associated micro-organisms have been isolated from many genital sites<sup>11–21</sup> including the subpreputial sac in normal men<sup>22</sup> and from men with balanoposthitis.<sup>11</sup> In preparation for a clinical trial to evaluate whether male genital hygiene improvement might reduce STI risk among men and their female partners, we designed a safety and acceptability trial of three candidate topical microbicide formulations among men in Nairobi, Kenya. Before initiating the trial we undertook the present study to ascertain hygiene beliefs, attitudes, and practices with a focus on genital hygiene in the context of sexual interactions.

## METHODS

This study took place between April and October 2002 at the special treatment centre (the primary STI and dermatology referral centre) in Nairobi, Kenya, and the Tumaini health

clinic in the Kibera slum area of the city. Using respondent driven sampling techniques, we recruited and enrolled 463 sexually active men above 18 years of age after they gave informed written consent<sup>23</sup> (table 1). We conducted quantitative in-depth interviews (IDI) and qualitative focus group discussions (FGD).

## Quantitative in-depth interview

Male enumerators interviewed all participants in English or Kiswahili. The interview consisted of a detailed quantitative survey instrument focusing on general hygiene behaviours, genital hygiene practices, circumcision and hygiene, and their temporal relation to sexual behaviours, along with demographic, ecological, and economic factors, which we believed might be associated with variance in hygiene behaviours.

## Demographic variables and risk perceptions

We assessed relations of hygiene behaviours to demographic factors such as age, self reported circumcision status (hygiene may represent a possible confounder between circumcision, STI, and HIV outcomes<sup>24–26</sup>), religion, ethnic group, marital status, any versus no children, and education ( $\geq 12$  years versus  $< 12$  years); HIV risk perception (belief that the chances of acquiring HIV were somewhat or extremely likely); and factors that could limit access to bathing such as income ( $> 3200$  or  $\leq 3200$  Kenya shillings), flowing tap water inside the house, total number of people in the house, and the number of people sharing a single bathing facility ( $> 10$  or  $\leq 10$ ). We included all of these variables in models for all outcome variables. For specific hygiene outcomes related to the most recent sexual encounter (described below) we also included additional variables regarding condom use and the type of sex partner classified as lower

**Abbreviations:** BV, bacterial vaginosis; FGD, focus group discussions; IDI, in-depth interviews; STI, sexually transmitted infections

**Table 1** Descriptive statistics for in-depth interview (IDI) and focus group discussion (FGD) participants

	IDI (n = 463)	FGD (n = 100)*
	Median or % (min, max) or (N)	Median or % (min, max) or (N)
Age (years)	27.6 (18, 62)	28.0 (18, 54)
Education (years)	12.0 (0, 23)	12.0 (2, 16)
Tribe		
Kikuyu	27.0 (125)	24
Luo	25.1 (116)	31
Luhya	14.0 (67)	16
Kamba	6.7 (31)	8
Other	26.8 (124)	21
Catholic	35.6 (165)	NA‡
Protestant	48.6 (225)	NA‡
Muslim	2.6 (12)	NA‡
Other	13.2 (61)	NA‡
Marital status		
Married	53.6 (248)	48
Unmarried	46.4 (215)	52
Income (Kenya shillings)†	3,500	NA‡
Number of people per discussion	NA‡	10 (6, 15)

\*FGD participants were selected as a subset of the IDI participants with a break characteristic of <30 and ≥30 years old.

†Approximately 75 Kenya shillings per US dollar.

‡Not available; In-depth interviews had one person per discussion and individuals were de-linked from IDI data when they were consented for the FGD. Religious affiliation information was not determined in the FGD.

risk (wife or girlfriend) or higher risk (casual partner or female sex worker).

### Hygiene behaviour outcomes

We created six hygienic behaviour variables, including four general indicators of hygienic behaviour such as bathing once daily versus bathing less than once daily, and ever versus never washing genitals aside from when normal bathing. We also asked men if they ever washed their genitals immediately (defined as <1 hour before and after sex respectively) before or after sex, or both. We also asked men if they washed their genitals immediately before and after their last sexual encounter.

### Focus group discussions

A subsample of 100 men who participated in the IDI volunteered to participate in the FGD. They provided separate written consent and enrolled in 10 FGD with age (18–29 and 30+) as a break characteristic. Each discussion group had 6–15 participants and lasted 1–2 hours. FGD participants did not differ appreciably from IDI participants for any characteristics (table 1). A same sex facilitator moderated the discussions in Kiswahili, English, or both. Guidelines

corresponded directly to the issues addressed in the IDI with special emphasis on eliciting perceptions of why behaviours occurred and the supporting norms and attitudes surrounding these activities. A note recorder attended and audio-taped all discussions. A single transcriptionist transcribed and translated the tapes into English.

### Data analyses

We performed all quantitative data analyses with the SPSS 11.5 statistical software package (SPSS Inc, Chicago, IL, USA). We used all hygiene behaviour outcomes as dependent variables and the demographic factors as independent variables in a series of bivariate and multivariate logistic regression models. After evaluating bivariate associations, we entered all demographic variables into multivariate logistic regression models. We then performed backward stepwise elimination, removing variables from the model one at a time until reaching a final model containing all variables associated (at the  $p \leq 0.1$  level) with the outcome of interest.

We entered all FGD transcripts into the Atlas ti qualitative data analysis software package (Scientific Software Development, Germany). We created and defined a priori descriptive codes relevant to hygienic and sexual behaviours and used them to label quotations and themes from the transcripts. We then analysed all coded text for themes and compared them to findings from the IDI.

## RESULTS

### Overall hygiene behaviour

Men reported bathing approximately once daily (table 2). Nearly 72% of respondents used shared bathing facilities and often reported sharing the bathing facility with many people (table 2). Most men reported going to locations outside the house and using a basin or more (≥5 litres) and a rag, towel, or natural sponge to wash themselves (table 2).

In bivariate analyses, education, income, and inside tap water were directly related to bathing at least once daily (table 3). Men sharing their bathroom with >10 others reported daily bathing less often than those sharing a facility with fewer individuals. In multivariate analyses, men with secondary school education or higher, those with higher than median income, and those with inside tap water reported bathing at least once daily more often than those with lower education, income, and with outside tap water (table 4).

FGD participants discussed difficulties in maintaining hygiene behaviours that echoed the IDI results. Seventy of 73 (96%) individuals who commented on their bathing habits stated that they would prefer to bathe more frequently. Obstacles to hygiene included a lack of financial resources to buy soap, cleaning materials, and water, and the extended distance to the sources where water was sold. One FGD participant said:

**Table 2** Percentage of participants engaging in specific hygiene behaviours

Overall hygiene	% (No)	Genital hygiene before sex	% (No)	Genital hygiene after sex	% (No)
Bathed at least once a day	68.0 (315)	Ever wash genitals before sex	14.1 (65)	Ever wash genitals after sex	74.4 (343)
Amount of water used in bath		If yes, how frequently		If yes, how frequently	
<¼ basin (<1.25 litres)	0	Almost never	3.1 (2)	Almost never	1.2 (4)
¼ basin (1.25 litres)	0.2 (1)	Sometimes	41.5 (27)	Sometimes	26.8 (92)
½ basin (2.5 litres)	16.6 (77)	Often	12.3 (8)	Often	11.4 (39)
Full basin (5 litres)	64.8 (300)	Almost always	43.1 (28)	Almost always	60.6 (208)
> Full basin (>5 litres)	18.4 (85)	Washed genitals before last sex partner	12.5 (58)	Washed genitals after last sex partner	36.1 (167)
Use shared bathing facilities	71.5 (331)				
Ever wash genitals aside from bathing	17.1 (79)				

**Table 3** Bivariate logistic regression analyses of factors associated with hygiene behaviours

	Bathe at least once per day OR (95% CI)	Wash genitals aside from bathing (ever) OR (95% CI)	Wash genitals before sex (ever) OR (95% CI)	Wash genitals after sex (ever) OR (95% CI)
Age (years)	1.0 (0.97 to 1.0)	0.99 (0.97 to 1.03)	1.02 (0.97 to 1.03)	0.99 (0.96 to 1.01)
Circumcision status	1.1 (0.7 to 1.8)	0.7 (0.4 to 1.3)	0.7 (0.4 to 1.2)	0.8 (0.5 to 1.4)
Education ( $\geq$ secondary)	1.8 (1.2 to 2.7)**	0.9 (0.6 to 1.6)	0.8 (0.5 to 1.4)	1.5 (1.1 to 2.3)**
Marital status	0.8 (0.6 to 1.3)	1.3 (0.8 to 2.1)	1.1 (0.7 to 1.9)	0.7 (0.5 to 1.1)
Any v no children	0.8 (0.6 to 1.2)	1.2 (0.8 to 2.0)	1.0 (0.6 to 1.7)	0.7 (0.5 to 1.1)*
Tribe:				
Luhya v Luo	1.3 (0.7 to 2.5)	1.0 (0.5 to 2.1)	0.8 (0.3 to 1.8)	0.7 (0.4 to 1.3)
Kikuyu v Luo	1.2 (0.7 to 2.0)	0.6 (0.3 to 1.1)*	0.7 (0.3 to 1.3)	0.9 (0.5 to 1.7)
Kamba v Luo	0.92 (0.40 to 2.11)	0.92 (0.34 to 2.5)	0.66 (0.21 to 2.1)	1.1 (0.4 to 2.7)
Other v Luo	1.0 (0.6 to 1.8)	0.7 (0.4 to 1.4)	0.6 (0.3 to 1.2)*	0.9 (0.5 to 1.6)
Protestant v Catholic	1.0 (0.7 to 1.6)	1.3 (0.7 to 2.2)	0.9 (0.5 to 1.6)	0.9 (0.6 to 1.4)
Muslim v Catholic	2.5 (0.5 to 11.8)	1.2 (0.2 to 5.7)	0.6 (0.1 to 4.5)	507.4 (0.0001 to 520)
Other v Catholic	1.3 (0.7 to 2.5)	1.6 (0.8 to 3.4)	1.5 (0.7 to 3.2)	2.7 (1.2 to 6.1)*
Perception of HIV risk	0.8 (0.6 to 1.2)	1.2 (0.8 to 2.0)	1.0 (0.6 to 1.8)	0.8 (0.5 to 1.2)
Income in last month	1.6 (1.1 to 2.4)**	1.2 (0.7 to 1.9)	1.1 (0.7 to 1.9)	1.1 (0.7 to 1.7)
Years lived in Nairobi	1.0 (0.99 to 1.02)	1.0 (1.0 to 1.0)	1.0 (1.0 to 1.1)	1.0 (1.0 to 1.0)
Total people in house	1.0 (0.93 to 1.1)	1.1 (1.03 to 1.3)**	0.96 (0.8 to 1.1)	0.93 (0.8 to 1.0)
Flowing tap water in house	2.2 (1.4 to 3.6)**	1.7 (1.1 to 2.8)**	1.6 (0.9 to 2.7)*	1.7 (1.1 to 2.8)**
Share bathroom with >10 others	0.6 (0.4 to 0.9)**	0.5 (0.3 to 0.8)**	0.5 (0.3 to 0.9)**	1.1 (0.7 to 1.7)

\* (0.05&gt;p&lt;0.10); \*\* (p&lt;0.05).

- There are others who stay without bathing for even 2 weeks because they do not have water and they do not have the money to buy (it).

Poor condition and crowding of shared bathing facilities were also mentioned as important factors in bathing frequency. Several men living in poorer areas of town bathed in their house, outside their front door at night, or in rivers running through these areas. One participant said:

- Where I live, people bathe in the river and outside (the house). The reason for bathing outside is that sometimes you may find that the (shared) bathroom has been messed up and they (sic) are only two and they are dirty, so one prefers to wait for the dark and bathe outside.

### Circumcision and genital hygiene

IDI and FGD participants reported different attitudes and behaviours regarding circumcision and hygiene. FGD participants believed that the genital hygiene habits of circumcised and uncircumcised individuals differed. Perceived differences included genital odour, time and care needed for washing, and frequencies with which men bathed. Many men believed the foreskin trapped sweat and urine after urination, leading to a foul smell if the genitalia were not washed frequently. One participant stated:

- He (an uncircumcised man) will have to clean (the genitals) because if he sweats his place (genital area) is dirty and if he does not remove the dirt and if it does not come out he will stink.

Another stated:

- The one who is circumcised is having an easy job because you clean it just the way you clean your fingers but the other one is having a big job. It's like that person who has long fingernails. You clean the nails; you are supposed to clean inside the nails so it takes a long time.

Finally, men reported that uncircumcised men needed to wash their genitals more frequently. One FGD participant stated:

- You know if someone is uncircumcised they cannot stay even 2 days without washing his thing. It smells terrible and the one who is circumcised could stay even a week and you know he has no dirt that is hiding in there.

The perceived differences in bathing habits documented in the FGD were not borne out in the IDI data. Circumcised and uncircumcised men did not differ in daily bathing, genital hygiene practices aside from normal bathing routines, or genital hygiene before sex or after sex (tables 3–5). However,

**Table 4** Multivariate logistic regression analyses of factors associated with hygiene behaviours

	Bathe at least once per day OR (95% CI)	Wash genitals aside from bathing (ever) OR (95% CI)	Wash genitals before sex (ever) OR (95% CI)	Ever wash genitals after sex (ever) OR (95% CI)
Education ( $\geq$ secondary)	1.5 (1.1 to 2.3)**			1.5 (0.95 to 2.3)*
Any v no children				
Tribe:				
Luhya v Luo				
Kikuyu v Luo				
Kamba v Luo				
Other v Luo				
Protestant v Catholic***				
Other v Catholic***				2.8 (1.2 to 6.8)**
Income in last month	1.6 (1.1 to 2.4)**			
Total people in house		1.2 (1.05 to 1.3)**		0.9 (0.8 to 0.99)**
Flowing tap water in house	2.1 (1.3 to 3.6)**			2.6 (1.4 to 4.9)**
Share bathroom with >10 others		0.5 (0.3 to 0.8)**	0.5 (0.3 to 0.9)**	1.6 (0.9 to 2.6)*

\* (0.05&gt;p&lt;0.10); \*\* (p&lt;0.05); \*\*\*Muslim data not shown because of small numbers.

**Table 5** Bivariate and multivariate logistic regression analyses of factors associated with hygiene before and after the most recent sexual partner

	Wash genitals before sex with most recent encounter OR (95% CI)		Wash genitals after sex with most recent encounter OR (95% CI)	
	Bivariate analysis	Multivariate analysis	Bivariate analysis	Multivariate analysis
Age	0.98 (0.95 to 1.0)		0.96 (0.93 to 0.98)**	0.97 (0.94 to 0.99)**
Circumcision status	0.7 (0.4 to 1.3)		1.5 (0.9 to 2.4)*	
Education ( $\geq$ secondary)	1.0 (0.6 to 1.8)		1.1 (0.7 to 1.60)	
Marital status	0.95 (0.5 to 1.6)		0.5 (0.3 to 0.75)**	
Any v no children	0.8 (0.5 to 1.4)		0.5 (0.3 to 0.7)**	0.6 (0.3 to 0.9)**
Tribes:				
Luhya v Luo	0.8 (0.3 to 1.9)		1.1 (0.6 to 2.0)	
Kikuyu v Luo	1.0 (0.5 to 2.1)		1.4 (0.8 to 2.4)	
Kamba v Luo	0.4 (0.1 to 1.6)		0.9 (0.4 to 2.1)	
Other v Luo	0.4 (0.2 to 0.9)**	0.3 (0.1 to 0.7)**	1.7 (1.1 to 2.9)**	
Protestant v Catholic	0.7 (0.4 to 1.4)		0.8 (0.5 to 1.2)	
Muslim v Catholic	2.6 (0.6 to 10.4)		1.9 (0.5 to 6.3)	
Other v Catholic	1.5 (0.7 to 3.3)		0.8 (0.4 to 1.40)	
Perception of HIV risk	0.4 (0.2 to 0.8)**	0.4 (0.2 to 0.8)**	0.7 (0.5 to 0.98)**	
Income in last month	1.1 (0.6 to 1.9)		1.1 (0.7 to 1.6)	1.4 (0.9 to 2.2)*
Years lived in Nairobi	1.0 (0.98 to 1.0)		0.98 (0.97 to 1.0)*	
Total people in house	1.0 (0.9 to 1.2)		0.95 (0.9 to 1.0)	
Flowing tap water in house	1.4 (0.8 to 2.6)		1.5 (0.95 to 2.2)*	
Share bathroom with >10 others	0.6 (0.3 to 1.0)*	0.5 (0.3 to 0.9)**	0.8 (0.6 to 1.2)	
Partner type†	0.8 (0.4 to 1.6)		1.0 (0.7 to 1.7)	
Use condoms during sex	1.2 (0.7 to 2.1)		1.5 (1.01 to 2.2)**	

\* (0.05>p<0.10); \*\* (p<0.05); †Lower risk (wife or girlfriend) v higher risk (casual partner or FSW).

men from “Other” smaller tribes (95% circumcised) reported washing their genitals before their last sex partner significantly less frequently than men from the Luo tribe (80% uncircumcised) (discussed below).

### Washing genitals aside from bathing

Less than 20% of men in the IDI reported ever washing their genitalia aside from when they were normally taking a bath (table 2). In bivariate analyses, ethnic group, the number of people in the household, having flowing tap water inside the house, number of people sharing the individual's bathroom, and the number of sexual partners were all associated with men washing their genitals aside from taking bath. In multivariate analyses, bathroom crowding and the number of people in the household were associated with ever washing genitals aside from normal bathing. FGD participants cited time and monetary constraints and lack of privacy as reasons for not washing aside from normal routines.

### Washing genitals before sex

Few men (14%) in the IDI reported ever washing their genitals before sex (table 2), and less than one half of these reported doing it “almost always” (table 2). In bivariate analyses, ethnicity, bathroom crowding and having inside tap water were associated with men ever washing their genitalia before sex (table 3). In a multivariate model, men who shared their bathroom with >10 people were less likely to report ever washing their genitals before sex compared those who shared their bathroom with  $\leq 10$  (table 4).

Similar proportions of men reporting ever bathing before sex (14%) and reported bathing before their last sex (12%) (table 2). The same factors associated with ever washing their genitals before sex except for inside tap water were associated with men washing their genitals before their last sexual encounter (table 5). Additionally, those who perceived themselves to be at higher risk of acquiring HIV and those from “other” tribes had a lower likelihood of washing their genitalia before their last sex partner as often compared with those who felt they were at lower risk and from the Luo tribe, respectively (table 5).

FGD participants stated that genital washing before sex was impractical because sex was viewed as a spontaneous

act, especially for single men. Men perceived insufficient “time to bathe” before sex, and said that resources like water, soap, and a place to bathe were not convenient in areas where they would have sex (for example, lodges, other homes, outdoors). Men also frequently reported that activities leading up to sex involved the generation of “heat” in the genital area and that bathing before sex would reduce this heat and make sex less pleasurable or not feasible. An FGD participant said:

- ...because if you do before (wash before sex) you will have heated her up, when you go to wash by the time you come back she will be cold and if you heat her up again she will still be cold (unreceptive to sex).

Additionally, men acknowledged that bathing before sex might arouse a partner's suspicion of infidelity. An FGD participant states:

- She may not accept (bathing before sex) because if yesterday I did not wash my genitals and today I am telling her I am washing mine she will think I have been sleeping out with another woman and that is why I am washing before I sleep with her.

### Washing genitals after sex

Of men interviewed, 74% reported ever washing their genitals immediately after sex ever and nearly 61% of these individuals reported engaging in these activities “almost always” (table 2).

Ever washing genitals after sex was associated with religious affiliation, having tap water inside the house, sharing the bathroom with many other people, the number of people in the household, and educational attainment (tables 3 and 4). Members of “other” smaller Christian faiths reported ever bathing after sex significantly more often than Catholics. Education, inside tap water, and bathroom crowding were directly associated and the number of people in the household inversely associated with ever washing after sex.

Fewer men (37%) reported bathing after their last sexual encounter (table 2). Age, ethnicity, number of children,



marital status, circumcision status, years of residence in Nairobi, and condom use were associated with bathing after sex in bivariate analysis (table 5). In the multivariate model, age and having “any” children were inversely associated and income directly associated with this variable (table 5).

FGD participants reported many reasons for washing their genitals after sex including removing the “smell” from sex. The majority of men also commented that sex resulted in feelings of “being dirty” and “contaminated” and that washing the genitals after sex removed these feelings. Several men also reported washing after sex to prevent acquiring a disease from a high risk partner or transmitting a disease to others. One participant mentioned:

- I think with prostitutes you must wash after you have sex with them. Because maybe there is some risk factor that you get a disease...maybe if you wash immediately you can avoid getting some disease.

Another participant said:

- All women have dirt, but the dirt you have is yours and you are used to it. But the one from the outside you don't know so you have to remove (it) because you could be sleeping with her dirt and you might infect the other one (another partner).

## DISCUSSION

Hygienic interventions to reduce STI risk among men date back to programmes for servicemen during the first and second world wars.<sup>8–10</sup> We have initiated three studies involving the use of topical microbicides by men. The first study, reported here, examined genital hygiene attitudes and practices and their temporal relation to sex. The second evaluated the safety and acceptability of three candidate topical microbicide formulations. Thirdly, we are conducting a randomised controlled trial of topical microbicide use by men to prevent the recurrence of BV in their sex partner. This first study demonstrates that men in resource limited areas of Africa realise the importance of bathing and some understand the role of genital hygiene in the transmission of STI. However, perceptions and factors associated with sexual partnerships, and exogenous individual and community level factors may constrain their genital hygiene behaviours.

Bathing at least once daily was linked to educational attainment and factors associated with access to bathing facilities and materials including income, flowing tap water location, and bathroom crowding. Comments from the FGDs support these findings.

We did not find an association between circumcision status and any reported hygiene behaviour. This finding is suggestive of statistical independence between circumcision, and hygiene and their possible association with STI and HIV risk. However, men from “other” tribes, the majority of whom are circumcised, were less likely to wash before their last sex partner than Luo men who were generally uncircumcised. It is unclear why this group in particular and not other tribes who traditionally circumcise (for example, Kikuyu, Luhya, and Kamba) had heterogeneous hygiene behaviours and this finding requires further exploration.

Men infrequently reported genital washing aside from regular bathing and before sex and some believed it was unrealistic given their sexual behaviour patterns. FGD participants cited a lack of time and material resources for bathing, belief that pre-sex hygiene would cool the “heat” of sex, and dynamics associated with trust in sexual interactions that would limit these behaviours. Bathroom crowding was consistently and inversely associated with these hygiene

## Key messages

- Genital microbial pathogens can be carried on male genital skin
- Hygiene behaviours are often influenced by demographic factors including education, religion, ethnicity, and income and may be constrained by crowding and limited access to resources required for hygiene
- Topical microbicides may improve genital hygiene among men

behaviours. Conversely, men who lived in crowded households were more apt to wash their genitals outside of normal routines. This may relate to a lack of privacy in these settings, and opportunistic bathing by these men.

Men more often reported ever washing their genitals after sex and some were able to articulate the possible links between hygiene behaviours and transmission of STI to other partners. Additionally, men from “other” Christian groups more often reported ever bathing after sex when compared to Catholics. These differences were not articulated during the FGDs or the IDI and require further inquiry.

The collection and analyses of these data had two main limitations. Firstly, we used non-random participant recruitment techniques, limiting generalisation of these findings to the broader population of men in Nairobi. However, the mixture of methods along with relatively large samples strengthen the consistency and internal validity of these results. Secondly, both components of this study relied on self reported hygiene behaviours. It is unclear whether social desirability influenced reported practices and attitudes.

Nairobi men reported difficulties in maintaining general and genital hygiene behaviours, associated in part with poor access to bathing facilities and resources. In many African societies, improving such access would require long term infrastructure developments to improve the standard of living. A disposable, inexpensive, safe, and discreet topical microbicide could provide a potential solution to this problem. Several microbicide formulations, used primarily by health workers to clean their hands in clinical settings, have safety, acceptability, and antimicrobial profiles that may make them good candidates for trials evaluating use in the genital area. Findings from this study may help inform future randomised trials to evaluate the possible impact of hygienic intervention, including by men, on STD and HIV transmission.

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## CONTRIBUTORS

MS wrote the text and conducted all of the statistical analyses; EB contributed to writing the text and gave insight into the outcomes and variables incorporated in the analyses and was a field supervisor for the study along with MS; CC contributed to the initial text and revised subsequent drafts; BS-D contributed to the initial text and revised subsequent drafts; KH contributed to the initial text and revised subsequent drafts, he also helped conceptualise the evaluation of hygiene beliefs and practices in relation to ongoing plans for

assessment of topical microbicide use by men; he supervised the creation and assessment of statistical models and the interpretation of qualitative results.

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#### REFERENCES

- Ness RB, Hillier SL, Richter HE, et al. Douching in relation to bacterial vaginosis, lactobacilli, and facultative bacteria in the vagina. *Obstet Gynecol* 2002;**100**:765.
- Reed BD, Ford K, Wirawan DN. The Bali STD/AIDS study: association between vaginal hygiene practices and STDs among sex workers. *Sex Transm Infect* 2001;**77**:46–5.
- Franco EL, Campos Filho N, Villa LL, et al. Correlation patterns of cancer relative frequencies with some socioeconomic and demographic indicators in Brazil: an ecologic study. *Int J Cancer* 1988;**41**:24–9.
- Brinton LA, Li JY, Rong SD, et al. Risk factors for penile cancer: results from a case-control study in China. *Int J Cancer* 1991;**47**:504–9.
- Brinton LA, Reeves WC, Brenes MM, et al. The male factor in the etiology of cervical cancer among sexually monogamous women. *Int J Cancer* 1989;**44**:199–203.
- Rotkin ID. Adolescent coitus and cervical cancer: associations of related events with increased risk. *Cancer Research* 1967;**27**:603–17.
- Rotkin ID. Sexual characteristics of a cervical cancer population. *Am J Public Health* 1967;**57**:815–29.
- Campbell DJ. Venereal diseases in the armed forces. *Br J Vener Dis* 1946;**22**:158–64.
- Moore JE. The value of prophylaxis against venereal diseases. *JAMA* 1920;**75**:911–15.
- Moore JE. The diagnosis of chancroid and the effect of prophylaxis upon its incidence in the American Expeditionary Forces. *J Urol* 1920;**4**:169–76.
- Burdge DR, Bowie WR, Chow AW. Gardnerella vaginalis-associated balanoposthitis. *Sex Transm Dis* 1986;**13**:159–62.
- Nagy E, Szoke I, Torok L, et al. The role of anaerobic bacteria in prostatitis. *Adv Exp Med Biol* 2000;**485**:289–99.
- Berger RE, Krieger JN, Rothman I, et al. Bacteria in the prostate tissue of men with idiopathic prostatic inflammation. *J Urol* 1997;**157**:863–5.
- Keane FE, Thomas BJ, Whitaker L, et al. An association between non-gonococcal urethritis and bacterial vaginosis and the implications for patients and their sexual partners. *Genitourin Med* 1997;**73**:373–7.
- Keane FE, Thomas BJ, Gilroy CB, et al. The association of Mycoplasma hominis, Ureaplasma urealyticum and Mycoplasma genitalium with bacterial vaginosis: observations on heterosexual women and their male partners. *Int J STD AIDS* 2000;**11**:356–60.
- Koch A, Bilina A, Teodorowicz L, et al. Mycoplasma hominis and Ureaplasma urealyticum in patients with sexually transmitted diseases. *Wien Klin Wochenschr* 1997;**109**:584–9.
- Shahmanesh M. Why common things are common: the tale of non-gonococcal urethritis. *Sex Transm Infect* 2001;**77**:139–40.
- Willen M, Holst E, Myhre EB, et al. The bacterial flora of the genitourinary tract in healthy fertile men. *Scand J Urol Nephrol* 1996;**30**:387–93.
- Swenson CE, Toth A, Toth C, et al. Asymptomatic bacteriospermia in infertile men. *Andrologia* 1980;**12**:7–11.
- Moberg PJ, Eneroth P, Ljung A, et al. Bacterial flora in semen before and after doxycycline treatment of infertile couples. *Int J Androl* 1980;**3**:46–58.
- Landgren BM, Ljung-Wadstrom A, Wikborn C, et al. Microbial findings in genital secretions from seven healthy fertile couples. *Med Microbiol Immunol (Berl)* 1984;**173**:179–85.
- Bukusi EA, Cohen CR, Meier AS, et al. Bacterial vaginosis risk factors among women and their male partners (in preparation).
- Heckathorn D. Respondent-driven sampling: a new approach to the study of hidden populations. *Social Problems* 1997;**44**:174–99.
- Bailey RC, Plummer FA, Moses S. Male circumcision and HIV prevention: current knowledge and future research directions. *Lancet Infect Dis* 2001;**1**:223–31.
- Bailey RC, Muga R, Poulussen R, et al. The acceptability of male circumcision to reduce HIV infections in Nyanza Province, Kenya. *AIDS Care* 2002;**14**:27–40.
- O'Farrell N. Soap and water prophylaxis for limiting genital ulcer disease and HIV-1 infection in men in sub-Saharan Africa. *Genitourin Med* 1993;**69**:297–300.